VOLUME I - GENERAL FACTORS

EXPOSURE FACTORS HANDBOOK

Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989

NOTICE

THIS DOCUMENT IS A PRELIMINARY DRAFT. It has not been formally released by the U.S. Environmental Protection Agency and should not at this stage be construed to represent Agency policy. It is being circulated for comments on its technical accuracy and policy implications.

VOLUME II - FOOD INGESTION FACTORS

EXPOSURE FACTORS HANDBOOK

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Office of Research and Development
National Center for Environmental Assessment
U.S. Environmental Protection Agency
Washington, DC 20460

VOLUME III - ACTIVITY FACTORS

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FOREWORD

The National Center for Environmental Assessment (NCEA) of EPA's Office of Research and Development (ORD) has five main functions: (1) providing risk assessment research, methods, and guidelines; (2) performing health and ecological assessments; (3) developing, maintaining, and transferring risk assessment information and training; (4) helping ORD set research priorities; and (5) developing and maintaining resource support systems for NCEA. The activities under each of these functions are supported by and respond to the needs of the various program offices. In relation to the first function, NCEA sponsors projects aimed at developing or refining techniques used in exposure assessments.

This handbook was first published in 1989 to provide statistical data on the various factors used in assessing exposure. This revised version of the handbook provides the up-to-date data on these exposure factors. The recommended values are based solely on our interpretations of the available data. In many situations different values may be appropriate to use in consideration of policy, precedent or other factors.

Michael A. Callahan Director National Center for Environmental Assessment, Washington Office



PREFACE

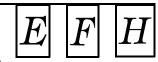
The National Center for Environmental Assessment has prepared this handbook to address factors commonly used in exposure assessments. This handbook was first published in 1989 in response to requests from many EPA Program and Regional offices for additional guidance on how to select values for exposure factors.

Several events sparked the efforts to revise the Exposure Factors Handbook. First, since its publication in 1989, new data have become available. Second, the Risk Assessment Council issued a memorandum titled, "Guidance on Risk Characterization for Risk Managers and Risk Assessors", dated February 26, 1992 which emphasized the use of multiple descriptors of risk (i.e., a measure of tendency such as average or mean central tendency, high end of individual risk, population risk, important subpopulations). Third, EPA published the revised Guidelines for Exposure Assessment.

As part of the efforts to revise the handbook, the EPA Risk Assessment Forum sponsored a two-day peer involvement workshop which was conducted during the summer of 1993. The workshop was attended by 57 scientists from academia, consulting firms, private industry, the states, and other Federal agencies. The purpose of the workshop was to identify new data sources, to discuss adequacy of the data and the feasibility of developing statistical distributions and to establish priorities.

As a result of the workshop, two new chapters have been added to the handbook. These chapters are:

Consumer Product Use and the Reference Residence. This document also provides a summary of the available data on consumption of drinking water; consumption of fruits, vegetables, beef, dairy products, and fish; soil ingestion; inhalation rates; skin surface area; soil adherence; lifetime; activity patterns; and body weight.



AUTHORS, CONTRIBUTORS, AND REVIEWERS

The National Center for Environmental Assessment (NCEA), Office of Research and Development was responsible for the preparation of this handbook. The original document was prepared by Versar Inc. under EPA Contract No. 68-02-4254, Work Assignment No. 189. John Schaum, of NCEA-Washington Office, served as the EPA Work Assignment Manager, providing overall direction and coordination of the production effort as well as technical assistance and guidance. Revisions, updates, and additional preparation were provided by Versar Inc. under Contract Numbers 68-D0-0101, 68-D3-0013, and 68-D5-0051. Russell Kinerson and Greg Kew have served as EPA Work Assignment Managers during previous efforts of the update process. Jackie Moya served as Work Assignment Manager for the current updated version, providing overall direction, technical assistance, and serving as contributing author.

AUTHORS DESKTOP PUBLISHING GRAPHICS

Patricia Wood Susan Perry Kathy Bowles Linda Phillips Jennifer Baker

Aderonke Adenuga WORD PROCESSING

Mike Koontz

Harry Rector Valerie Schwartz

Charles Wilkes Margaret Wilson

Exposure Assessment Division Versar Inc. Springfield, VA

CONTRIBUTORS AND REVIEWERS

The following EPA individuals have reviewed and/or have been contributing authors of this document.

Michael Dellarco Paul Pinsky John Schaum Robert McGaughy Amy Mills Paul White Jacqueline Moya Amina Wilkins Chieh Wu Susan Perlin

An earlier draft of this document was peer reviewed by a panel of experts at a peer-review workshop held in 1995. Members of the Peer Review Panel were as follows:

Edward Avol U.S. Department of Agriculture

Department of Preventive Medicine

School of Medicine P.J. (Bert) Hakkinen

University of Southern California Paper Product Development & Paper Technology

Divisions

The Proctor & Gamble Company James Axley

School of Architecture

Yale University Mary Hama

Beltsville Human Nutrition Research Center

David Burmaster U.S. Department of Agriculture

Alceon Corporation

Dennis Jones

Agency for Toxic Substances & Disease Registry Steven Colome

Integrated Environmental Services

John Kissel

Michael DiNovi Department of Environmental Health

Chemistry Review Branch School of Public Health & Community Medicine

U.S. Food & Drug Administration

Neil Klepeis

Information Systems & Services, Inc. Dennis Druck

Environmental Scientist

Center of Health Promotion & Preventive Andrew Persily

National Institute of Standards & Technologies Medicine

U.S. Army

Barbara Petersen

J. Mark Fly Technical Assessment Systems, Inc.

Department of Forestry, Wildlife, & Fisheries

University of Tennessee Thomas Phillips

Research Division

California Air Resources Board Larry Gephart

Exxon Biomedical Sciences, Inc.

Paul Price

Patricia Guenther ChemRisk

Beltsville Human Nutrition Research Center

Page vi



John Risher

Division of Toxicology

The Agency for Toxic Substances & Disease Registry

Val Schaeffer

John Robinson U.S. Consumer Product Safety Commission

University of Maryland

Peter Robinson Brad Shurdut

Owellanco

The Proctor & Gamble Company

John Talbott
P. Barry Ryan
U.S. Department of Energy

P. Barry Ryan
Department of Environmental & Occupational

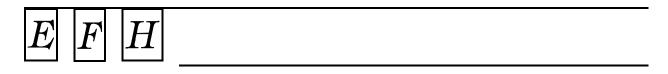
Health Frances Vecchio

Rollins School of Public Health Beltsville Human Nutrition Research Center

Emory University U.S. Department of Agriculture

The following individuals within EPA have reviewed an earlier draft of this document and provided valuable comments:

OFFICE	REVIEWERS/CONTRIBUTORS
Office of Research and Development	Maurice Berry Jerry Blancato Elizabeth Bryan Curtis Dary Stan Durkee Manuel Gomez Wayne Marchant Sue Perlin James Quanckenboss Glen Rice Lance Wallace
Office of Emergency and Remedial Response	Jim Konz
Office of Pollution, Pesticides and Toxic Substances	Pat Kennedy Cathy Fehrenbacker
Office of Water	Denis Borum
Office of Air Quality Planning and Standards	Warren Peters
EPA Regions	Steve Ehlers - Reg. VI Maria Martinez - Reg. VI Mike Morton - Reg. VI Jeffrey Yurk - Reg. VI Youngmoo Kim - Reg. VI



In addition, the National Exposure Research Laboratory (NERL) of the Office of Research and Development of EPA made an important contribution to this handbook by conducting additional analysis of the National Human Activity Pattern Survey (NHAPS) data. EPA input to the NHAPS data analysis came from Karen A. Hammerstrom and Jacqueline Moya from NCEA-Washington Office; William C. Nelson from NERL-RTP, and Stephen C. Hern, Joseph V. Behar (retired), and William H. Englemann from NERL-Las Vegas.



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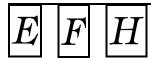
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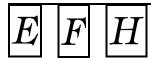
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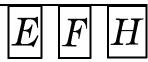
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